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MEMORANDUM

TO: Liz Hamilton

FROM: Michele DeHart

DATE: September 24, 2010

RE: Adult fall Chinook counts at Priest Rapids Dam in relation to those at McNary and Ice Harbor dams.

In response to your request the Fish Passage Center staff has reviewed current and historic adult count data for fall Chinook at McNary (MCN), Priest Rapids (PRD), and Ice Harbor (IHR) dams. The FPC staff also reviewed Hanford Reach escapement data supplied by U.S. Fish and Wildlife Service (USFWS), hatchery production data for fall Chinook above McNary Dam, and timing data of PIT-tagged fall Chinook adults at McNary Dam. Below, we provide a brief overview of our findings from these data, followed by a more detailed explanation of our analyses.

- As of September 22nd, the adult fall Chinook count at MCN is 1.48 times the 2009 count and 1.41 times the 10-year average. At IHR, the 2010 count is 1.56 times the 2009 count and 2.65 times the 10-year average. Finally, at PRD, the 2010 count is 70.9% of the 2009 count and 84.6% of the 10-year average.
- So far, the Snake River fall Chinook count represents approximately 28.7% of the adult fall Chinook count at MCN, while the Priest Rapids Dam fall Chinook count represents only 15.2% of the adult fall Chinook count at MCN.
 - Review of historical timing data indicate that these differential proportions of Snake River and PRD composition of the McNary count for 2010 are not due to differential timing of the two groups.

- The PRD adult fall Chinook dam counts in 2010 represent a lower proportion of the MCN counts than has occurred over the past 10 years while the IHR adult counts represent a larger proportion.
 - From 1990 to 1999, the portion of the fall Chinook adult count at MCN that is made up Snake River fall Chinook (as determined by counts at IHR) averaged about 6.0%, whereas the average from 2000 to 2009 has averaged nearly 14.7%.
 - From 1990 to 1999, the portion of the fall Chinook adult count at MCN that is made up adults counted at PRD averaged about 13.6%, whereas the average from 2000 to 2009 has averaged nearly 26.1%.
- In the past 10 years, the proportion of the MCN adult fall Chinook returns that are comprised of Hanford Reach fall Chinook (as determined by escapement estimates) has decreased, when compared to the previous 10 years
 - From 1990 to 1999, the portion of the fall Chinook adult count at McNary Dam that is made up Hanford Reach fall Chinook averaged about 54.6%, where as the average from 2000 to 2009 has averaged nearly 38.9%.
 - Estimates of escapement of adult fall Chinook to the Hanford Reach have decreased, particularly in the past three years.
- A review of data from the past 20 years illustrates that the proportion of the MCN adult fall Chinook count that is comprised of Snake River fall Chinook and fall Chinook adults that were counted at PRD has increased, while the proportion that is comprised of Hanford Reach fall Chinook has decreased.
- Of the total production of fall Chinook juveniles above McNary Dam, the proportion that are released in the Snake River has increased over the last twenty years, while the proportion that are released in the Columbia River has declined. The proportion released into the Yakima River has remained fairly consistent over the past twenty years.
- The increase in the proportion of the MCN dam adult fall Chinook returns being attributed to Snake River fall Chinook is likely due do a combination of a few things, including: 1) an increase in the production of fall Chinook juveniles in the Snake River, 2) a decrease in the production of fall Chinook juveniles in the Columbia River (above MCN), and 3) a decrease in fall Chinook adult escapement to the Hanford Reach, particularly in the past three years.

Timing of PIT-tagged fall Chinook adults at McNary Dam.

During counting, the classification of fall Chinook adults at McNary Dam is based on the date of passage, where adult Chinook passing MCN on or after August 9th are considered fall Chinook. FPC staff analyzed PIT-tag detections of adult fall Chinook on or after August 9th at McNary Dam to determine the average timing of those adults that originated from the Snake River compared to those that originated from the mid-Columbia River (including Yakima River, Hanford Reach, Priest Rapids Hatchery, etc.). Fall Chinook jacks (1-ocean) were included in this analysis. However, fall Chinook mini-jack (0-ocean) returns were not included. Given that adult PIT-tag detection was not available at MCN until 2002, this analysis was limited to return years 2002 through 2009.

Timing data for Mid-Columbia fall Chinook adults are somewhat limited, as far fewer Mid-Columbia fall Chinook are PIT-tagged than are Snake River fall Chinook. This means that timing of PIT-tagged Mid-Columbia River fall Chinook is based on fewer adults detected at

McNary. Based on our analysis of PIT-tagged adult returns, it appears that Mid-Columbia fall Chinook adults return to McNary Dam slightly earlier than Snake River fall Chinook adult (Table 1, Figure 1). On average, the 10%, 50%, and 90% passage dates for Mid-Columbia River fall Chinook were all 2 to 4 days earlier than those for Snake River fall Chinook adults.

Table 1. Estimated 10%, 50%, and 90% passage date of PIT-tagged Snake River and Mid-Columbia River adult fall Chinook at McNary Dam. All adults used in this analyses were released as juveniles above McNary Dam.

Return Year	Origin of PIT-tagged Adult	10% Passage Date	50% Passage Date	90% Passage Date
2002	MCOL	8-Sep	17-Sep	1-Oct
2003	MCOL	29-Aug	11-Sep	28-Sep
2004	MCOL	30-Aug	11-Sep	4-Oct
2005	MCOL	16-Aug	9-Sep	26-Sep
2006	MCOL	28-Aug	20-Sep	10-Oct
2007	MCOL	4-Sep	20-Sep	30-Sep
2008	MCOL	31-Aug	10-Sep	20-Sep
2009	MCOL	29-Aug	13-Sep	27-Sep
8-year Average		29-Aug	13-Sep	29-Sep
2002	SNAKE	9-Sep	22-Sep	8-Oct
2003	SNAKE	7-Sep	23-Sep	7-Oct
2004	SNAKE	4-Sep	14-Sep	30-Sep
2005	SNAKE	3-Sep	15-Sep	2-Oct
2006	SNAKE	29-Aug	14-Sep	4-Oct
2007	SNAKE	5-Sep	20-Sep	6-Oct
2008	SNAKE	28-Aug	8-Sep	24-Sep
2009	SNAKE	28-Aug	10-Sep	26-Sep
8-year Average		2-Sep	15-Sep	2-Oct

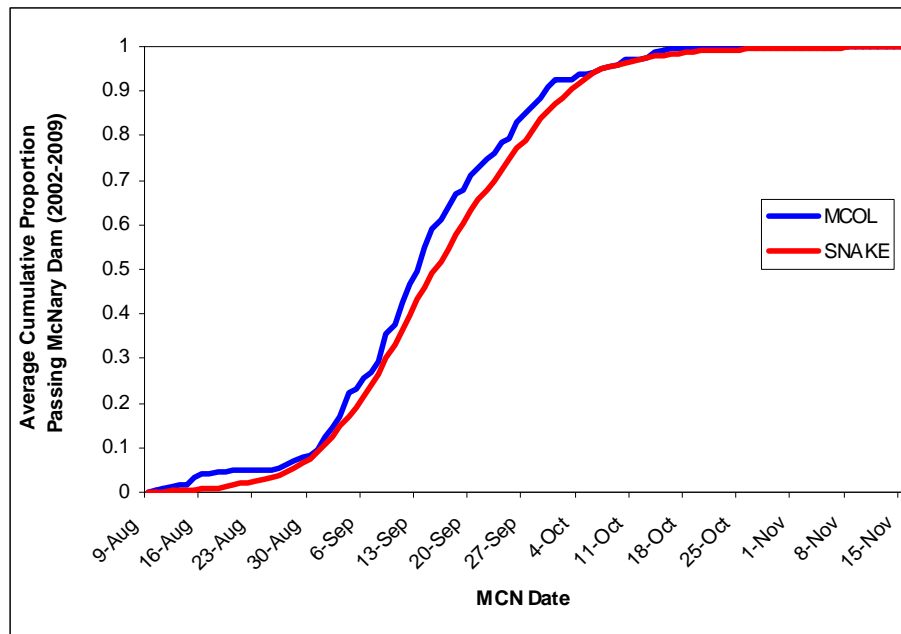


Figure 1. Average cumulative passage timing of PIT-tagged Snake River and Mid-Columbia River adult fall Chinook detected at McNary Dam. All adults used in this analysis were released as juveniles above McNary Dam.

Estimates of fall Chinook adults at McNary Dam, Ice Harbor Dam, and Priest Rapids Dam, and the Hanford Reach

The Fish Passage Center staff reviewed estimates of fall Chinook escapement to the Hanford Reach, as well as adult dam counts at McNary, Ice Harbor, and Priest Rapids dams over the past twenty years (1990-2009). These data were provided by the USFWS. These data were used to determine what proportion of the McNary Dam count was represented by Hanford Reach fall Chinook population (as determined by estimates of escapement), the Priest Rapids dam count, and Snake River fall Chinook (as determined by the Ice Harbor dam count). Both adults and jacks were included in this analysis.

As of September 22, 2010, 112,842 adult fall Chinook have been counted at MCN. This adult count is approximately 1.48 times what was seen in 2009 and 1.41 times the 10-year average. At IHR, the adult fall Chinook count is 32,335, which is 1.56 times the 2009 count and 2.65 times the 10-year average. Finally, the PRD adult fall Chinook count is 17,208, which is 70.9% of the 2009 count and 84.6% of the 10-year average. As of September 22nd, the Snake River fall Chinook count represents approximately 28.7% of the adult fall Chinook count at MCN, while the PRD fall Chinook count represents only 15.2% of the adult fall Chinook count at MCN.

On average, from 1990 to 1999, the Snake River fall Chinook population (as determined by the adult counts at IHR) represented approximately 6% of the MCN adult count (Table 2, Figure 2). However, the proportion of the MCN count that is made up of Snake River fall Chinook has increased over the past 10 years. From 2000 to 2009, the Snake River fall Chinook population represented approximately 14.7% of the MCN adult count (Table 2, Figure 2). At 28.7%, the Snake River proportion for 2010 is the highest on record (although not complete yet) and is higher than the average of the most recent 10 years (2000-2009).

The proportion of the MCN count that ends up at PRD has also increased over the past 10 years. From 1990 to 1999, the PRD fall Chinook count represented approximately 13.6% (on average) of the MCN adult count (Table 2, Figure 2). From 2000 to 2009, the PRD fall Chinook count represented approximately 26.2% of the MCN adult count (Table 2, Figure 2). However, 15.2%, the PRD proportion for 2010 is lower than that for recent years and more similar to what was seen from 1990 to 1999.

Finally, the proportion of the MCN count that ends up at the Hanford Reach has decreased over the past 10 years. From 1990 to 1999, the Hanford Reach fall Chinook population represented approximately 54.6% (on average) of the MCN adult count (Table 2, Figure 2). However, from 2000 to 2009, the Hanford Reach fall Chinook population represented only about 38.9% of the MCN count (Table 2, Figure 2). An estimate for 2010 is not yet possible, as escapement estimates are based on final return numbers to MCN, PRD, IHR, and other areas, as well as and harvest estimates.

One explanation for the Hanford Reach fall Chinook population becoming a lower proportion of the MCN adult returns in the recent decline in the Hanford Reach adult population, particularly in the last three years. In fact, the escapement estimates for 2007 and 2008 were the lowest among the 20 years we analyzed (Table 2).

Table 1. Estimates of adult fall Chinook abundance at McNary Dam, Snake River (at Ice Harbor Dam), Priest Rapids Dam, and the Hanford Reach. Proportions are expressed as the proportion of the McNary Dam count. Data were provided by the USFWS.

Return Year	McNary Count	Snake River Count (at IHR)	Proportion Snake River	Priest Rapids Count	Proportion Priest Rapids	Hanford Reach Escapement	Proportion Hanford Reach
1990	57,612	3,470	0.060	6,095	0.106	40,117	0.696
1991	47,307	4,489	0.095	4,690	0.099	31,971	0.676
1992	51,189	4,636	0.091	4,354	0.085	29,449	0.575
1993	54,876	2,805	0.051	7,183	0.131	30,650	0.559
1994	85,932	2,073	0.024	11,829	0.138	48,857	0.569
1995	68,186	2,750	0.040	13,273	0.195	36,244	0.532
1996	73,929	3,851	0.052	12,555	0.170	36,978	0.500
1997	67,192	2,767	0.041	11,201	0.167	36,961	0.550
1998	63,791	4,220	0.066	9,662	0.151	29,126	0.457
1999	78,356	6,532	0.083	9,542	0.122	27,014	0.345
2000	66,378	6,509	0.098	19,127	0.288	24,856	0.374
2001	110,517	13,635	0.123	16,957	0.153	42,454	0.384
2002	141,682	15,248	0.108	24,137	0.170	67,515	0.477
2003	178,951	20,998	0.117	43,691	0.244	88,154	0.493
2004	169,348	21,104	0.125	39,162	0.231	78,347	0.463
2005	133,999	14,677	0.110	28,160	0.210	67,543	0.504
2006	90,754	10,272	0.113	18,851	0.208	47,095	0.519
2007	58,733	13,408	0.228	22,650	0.386	13,887	0.236
2008	101,869	21,896	0.215	33,618	0.330	18,761	0.184
2009	104,544	24,824	0.237	40,606	0.388	26,346	0.252

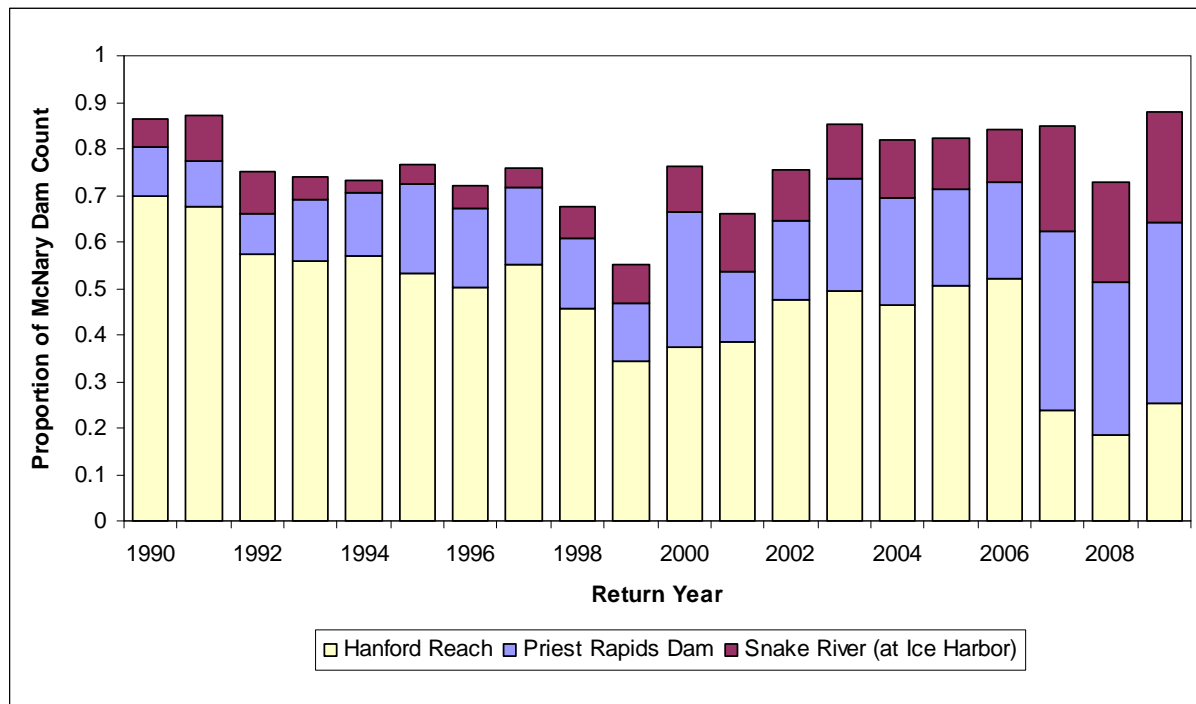


Figure 2. Proportion of McNary Dam fall Chinook count that is represented by the estimated Hanford Reach population, the Priest Rapids dam count, and the Snake River fall Chinook count (as determined by the counts at Ice Harbor Dam). These data were provided by the USFWS.

Hatchery production of fall Chinook juveniles above McNary Dam

One possible explanation for the Snake River fall Chinook population representing a larger proportion of the adult returns to McNary Dam over recent years is the production and release of hatchery juveniles. FPC staff reviewed hatchery releases of fall Chinook above MCN over the past 20 years. Releases of hatchery fall Chinook above MCN were broken into three different categories: 1) Columbia River, 2) Yakima River, and 3) Snake River.

Of the hatchery fall Chinook juveniles that are released above MCN, the proportion that are released in the Snake River has increased over the past 20 years. From 1991 to 2000, Snake River fall Chinook represented 6.8% (on average) of the overall production of fall Chinook above MCN (Table 2, Figure 3). However, from 2001 to 2010, Snake River fall Chinook represented 27.6% of the overall production of fall Chinook juveniles above MCN (Table 2, Figure 3). Of the hatchery fall Chinook juveniles that are released above MCN, the proportion that are released in the Yakima has remained fairly consistent (average 12.3%, range 0.0% to 22%) (Table 2, Figure 3). Finally, of the hatchery fall Chinook juveniles that are released above MCN, the proportion that are released in the Columbia River has decreased over the past 20 years. From 1991 to 2000, Columbia River releases represented 80.0% (on average) of the overall production of fall Chinook above MCN while the average for the 2001 to 2010 period was 59.9%. (Table 2, Figure 3).

Table 2. Hatchery production of fall Chinook juveniles (above McNary) to the Columbia River, Yakima River, and Snake River over the past twenty years (1991-2010).

Migration Year	Total Released above MCN	Columbia River	Proportion Columbia River	Yakima River	Proportion Yakima River	Snake River	Proportion Snake River
1991	7,420,425	5,564,020	0.750	1,631,745	0.220	224,660	0.030
1992	7,905,701	7,216,100	0.913		0.000	689,601	0.087
1993	9,829,375	8,114,423	0.826	748,159	0.076	966,793	0.098
1994	14,765,972	12,466,919	0.844	1,695,392	0.115	603,661	0.041
1995	14,774,472	12,704,972	0.860	1,694,518	0.115	374,982	0.025
1996	13,052,168	10,736,979	0.823	1,685,278	0.129	629,911	0.048
1997	13,544,775	10,707,097	0.790	1,700,000	0.126	1,137,678	0.084
1998	12,766,213	10,228,807	0.801	1,695,399	0.133	842,007	0.066
1999	13,706,696	9,988,800	0.729	1,882,000	0.137	1,835,896	0.134
2000	15,527,794	10,292,897	0.663	2,001,037	0.129	3,233,860	0.208
2001	14,512,562	9,837,455	0.678	2,138,889	0.147	2,536,218	0.175
2002	14,579,283	9,062,055	0.622	1,851,427	0.127	3,665,801	0.251
2003	16,346,557	10,100,551	0.618	2,154,538	0.132	4,091,468	0.250
2004	14,763,031	9,821,876	0.665	2,361,808	0.160	2,579,347	0.175
2005	16,656,815	9,399,893	0.564	2,349,219	0.141	4,907,703	0.295
2006	13,850,437	6,946,192	0.502	1,934,501	0.140	4,969,744	0.359
2007	15,408,203	10,145,631	0.658	1,845,733	0.120	3,416,839	0.222
2008	13,775,817	7,645,755	0.555	900,169	0.065	5,229,893	0.380
2009	18,481,382	10,291,389	0.557	1,978,610	0.107	6,211,383	0.336
2010	17,965,424	10,175,210	0.566	2,024,000	0.113	5,766,214	0.321

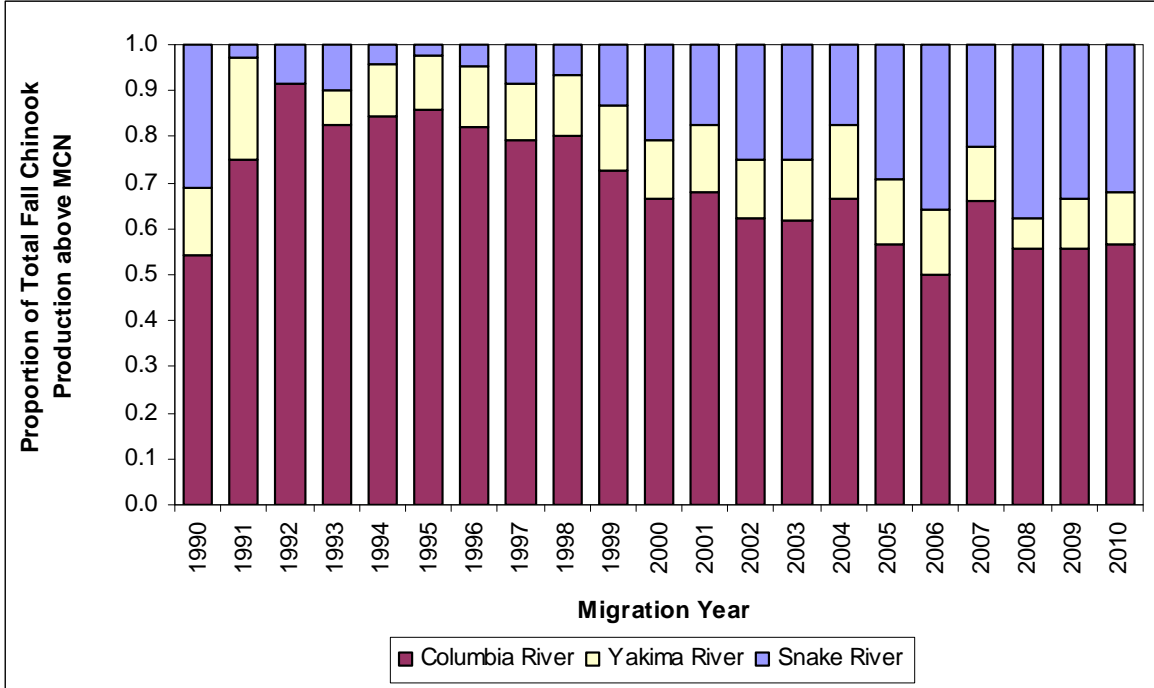


Figure 3. Proportion of the total hatchery production of fall Chinook juveniles above McNary Dam that are released into the Columbia, Yakima, and Snake rivers over the last 20 years (1990-2010).